29 CFR 1910.147 Control of Hazardous Energy Sources (Lockout/Tagout)

"No individual in the United States shall, on the grounds of race, color, religion, sex, national origin, age, disability, political affiliation or belief, be excluded from participation in, or denied the benefits of, or be subjected to discrimination under any program or activity under the jurisdiction of the Kentucky Labor Cabinet."

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29 CFR 1910.147
(as adopted by 803 KAR 2:309)
CONTROL OF HAZARDOUS ENERGY
(Lockout/Tagout)

(a) Scope, application and purpose

(1) Scope.

(i) This standard covers the servicing and maintenance of machines and equipment in which the unexpected energization or start up of the machines or equipment, or release of stored energy could cause injury to employees. This standard establishes minimum performance requirements for the control of such hazardous energy.

(ii) This standard does not cover the following:

(A) Construction, agriculture and maritime employment;

(B) Installations under the exclusive control of electric utilities for the purpose of power generation, transmission and distribution, including related equipment for communication or metering; and

(C) Exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installations, which is covered by Subpart S of this part; and

(D) Oil and gas well drilling and servicing.

(2) Application.

(i) This standard applies to the control of energy during servicing and/or maintenance of machines and equipment.

(ii) Normal production operations are not covered by this standard (See Subpart O of this Part). Servicing and/or maintenance which takes place during normal production operations is covered by this standard only if:

(A) An employee is required to remove or bypass a guard or other safety device; or

(B) An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

Note: *Exception to paragraph (a)(2)(ii):*
Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations,

are not covered by this standard if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection (See Subpart O of this Part).

(iii) This standard does not apply to the following:

(A) Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energization or start up of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance.

(B) Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water or petroleum products when they are performed on pressurized pipelines, provided that the employer demonstrates that (1) continuity of service is essential; (2) shutdown of the system is impractical; and (3) documented procedures are followed, and special equipment is used which will provide proven effective protection for employees.

(3) Purpose.

(i) This section requires employers to establish a program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices, and to otherwise disable machines or equipment to prevent unexpected energization, start up or release of stored energy in order to prevent injury to employees.

(ii) When other standards in this part require the use of lockout or tagout, they shall be used and supplemented by the procedural and training requirements of this section.

(b) Definitions applicable to this section

Affected employee. An employee whose job required him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job required him/her to work in an area in which such servicing or maintenance is being performed.

Authorized employee. A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this section.

Capable of being locked out. An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Energized. Connected to an energy source or containing residual or stored energy.

Energy isolating device. A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

Energy source. Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Hot tap. A procedure used in the repair maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

Lockout. The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device. A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

Normal production operations. The utilization of a machine or equipment to perform its intended production function.

Servicing and/or maintenance. Workplace activities such as construction, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

Setting up. Any work performed to prepare a machine or equipment to perform its normal production operation.

Tagout. The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout device. A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

(c) General

(1) Energy control program. The employer shall establish a program consisting of energy control procedures, employee training and periodic inspections to ensure that before

any employee performs any servicing or maintenance on a machine or equipment where the unexpected energizing, startup or release of stored energy could occur and cause injury, the machine or equipment shall be isolated from the energy source and rendered inoperative.

(2) Lockout/tagout.

(i) If an energy isolating device is not capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize a tagout system.

(ii) If an energy isolating device is capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize a lockout.

(iii) After January 2, 1990, whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machine or equipment shall be designed to accept a lockout device.

(3) Full employee protection.

(i) When a tagout device is used on an energy isolating device which is incapable of being locked out, the tagout device shall be attached at the same location that the lockout device would have been attached, and the employer shall demonstrate that the tagout program will provide a level of safety equivalent to that obtained by using a lockout program.

(ii) In demonstrating that a level of safety is achieved in the tagout program which is equivalent to the level of safety obtained by using a lockout program, the employer shall demonstrate full compliance with all tagout-related provisions of this standard together with such additional elements as are necessary to provide the equivalent safety available from the use of a lockout device. Additional means to be considered as part of the demonstration of full employee protection shall include the implementation of additional safety measures such as the removal of an isolating circuit, element, blocking of a controlling switch, opening of an extra disconnecting device, or the removal of a valve handle to reduce the likelihood of inadvertent energization.

(4) Energy control procedure.

(i) Procedures shall be developed, documented and utilized for the control of potentially hazardous energy when employees are engaged in the activities covered by this section.

Note: *Exception: The employer need not document the required procedure for a particular machine or equipment, when all of the following elements exist: (1) The machine or equipment has no potential for stored or residual energy or reaccumulation of stored energy after shut down which could endanger employees; (2) the machine or equipment has a single energy source which can be readily identified and isolated; (3) the isolation and locking out of that*

energy source will completely deenergize and deactivate the machine or equipment; (4) the machine or equipment is isolated from that energy source and locked out during servicing or maintenance; (5) a single lockout device will achieve a locked-out condition; (6) the lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance; (7) the servicing or maintenance does not create hazards for other employees; and (8) the employer, in utilizing this exception, has had no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing or maintenance.

(ii) The procedures shall clearly and specifically outline the scope, purpose, authorization, rules, and techniques to be utilized for the control of hazardous energy, and means to enforce compliance including, but not limited to, the following:

(A) A specific statement of the intended use of the procedure;

(B) Specific procedural steps for shutting down, isolating, blocking and securing machines or equipment to control hazardous energy;

(C) Specific procedural steps for the placement, removal and transfer of lockout devices or tagout devices and the responsibility for them; and

(D) Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

(5) Protective materials and hardware.

(i) Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided by the employer for isolating, securing or blocking of machines or equipment from energy sources.

(ii) Lockout devices and tagout devices shall be singularly identified; shall be the only device(s) used in controlling energy; shall not be used for other purposes; and shall meet the following requirements:

(A) Durable

(1) Lockout and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

(2) Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.

(3) Tags shall not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored.

(B) Standardized

Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: color; shape; or size; and additionally, in the case of tagout devices, print and format shall be standardized.

(C) Substantial

(1) Lockout devices. Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.

(2) Tagout devices. Tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece all environment-tolerant nylon cable tie.

(D) Identifiable

Lockout devices and tagout devices shall indicate the identity of the employee applying the device(s).

(iii) Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following: *Do Not Start. Do Not Open. Do Not Close. Do Not Energize. Do Not Operate.*

(6) Periodic inspection.

(i) The employer shall conduct a periodic inspection of the energy control procedure at least annually to ensure that the procedure and the requirements of this standard are being followed.

(A) The periodic inspection shall be performed by an authorized employee other than the one(s) utilizing the energy control procedure being inspected.

(B) The periodic inspection shall be conducted to correct any deviations or inadequacies identified.

(C) Where lockout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

(D) Where tagout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized and affected employee, of that employee's responsibilities under the energy control procedure being inspected, and the elements set forth in paragraph (c)(7)(ii) of this section.

(ii) The employer shall certify that the periodic inspections have been performed. The certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the employees included in the inspection, and the person performing the inspection.

(7) Training and communication.

(i) The employer shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees. The training shall include the following:

(A) Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.

(B) Each affected employee shall be instructed in the purpose and use of the energy control procedure.

(C) All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

(ii) When tagout systems are used, employees shall also be trained in the following limitations of tags:

(A) Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.

(B) When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.

(C) Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.

(D) Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.

(E) Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

(F) Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

(iii) Employee retraining.

(A) Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

(B) Additional retraining shall also be conducted whenever a periodic inspection under paragraph (c)(6) of this section reveals, or whenever the employer has reason to believe that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

(C) The retraining shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

(iv) The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.

(8) Energy isolation. Lockout or tagout shall be performed only by the authorized employees who are performing the servicing or maintenance.

(9) Notification of employees. Affected employees shall be notified by the employer or authorized employee of the application and removal of lockout devices or tagout devices. Notification shall be given before the controls are applied, and after they are removed from the machine or equipment.

(d) Application of control

The established procedures for the application of energy control (the lockout or tagout procedures) shall cover the following elements and actions, and shall be done in the following sequence:

(1) Preparation for shutdown. Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.

(2) Machine or equipment shutdown. The machine or equipment shall be turned off or shut down using the procedures established for the machine or equipment. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.

(3) Machine or equipment isolation. All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source(s).

(4) Lockout or tagout device application.

(i) Lockout or tagout devices shall be affixed to each energy isolating device by authorized employees.

(ii) Lockout devices, where used, shall be affixed in a manner to that will hold the

energy isolating devices in a “safe” or “off” position.

(iii) Tagout devices, where used, shall be affixed in a manner as will clearly indicate that the operation or movement of energy isolating devices from the “safe” or “off” position is prohibited.

(A) Where tagout devices are used with energy isolating devices designed with the incapability of being locked, the tag attachment shall be fastened at the same point at which the lock would have been attached.

(B) Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

(5) Stored energy.

(i) Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe.

(ii) If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.

(6) Verification of isolation.

Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and deenergization of the machine or equipment have been accomplished.

(e) Release from lockout or tagout

Before lockout or tagout devices are removed and energy is restored to the machine or equipment, procedures shall be followed and actions taken by the authorized employee(s) to ensure the following:

(1) The machine or equipment. The work area shall be inspected to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

(2) Employees.

(i) The work area shall be checked to ensure that all employees have been safely positioned or removed.

(ii) Before lockout or tagout devices are removed and before machines or equipment are energized, affected employees shall be notified that the lockout or tagout devices have been removed.

(iii) After lockout or tagout devices have been removed and before a machine or

equipment is started, affected employees shall be notified that the lockout or tagout device(s) have been removed.

(3) Lockout or tagout devices removal.

Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device. Exception to paragraph (e)(3). When the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed under the direction of the employer, provided that specific procedures and training for such removal have been developed, documented and incorporated into the employer's energy control program. The employer shall demonstrate that the specific procedure shall include at least the following elements:

(i) Verification by the employer that the authorized employee who applied the device is not at the facility;

(ii) Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed; and

(iii) Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

(f) Additional requirements

(1) Testing or positioning of machines, equipment or components thereof. In situations in which lockout or tagout devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequence of actions shall be followed:

(i) Clear the machine or equipment of tools and materials in accordance with paragraph (e)(1) of this section;

(ii) Remove employees from the machine or equipment area in accordance with paragraph (e)(2) of this section;

(iii) Remove the lockout or tagout devices as specified in paragraph (e)(3) of this section;

(iv) Energize and proceed with testing or positioning;

(v) Deenergize all systems and reapply energy control measures in accordance with paragraph (d) of this section to continue the servicing and/or maintenance.

(2) Outside personnel (contractors, etc.).

(i) Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer shall inform each other of their respective lockout or tagout procedures.

(ii) The on-site employer shall ensure that his/her employees understand and

comply with the restrictions and prohibitions of the outside employer's energy control program.

(3) Group lockout or tagout.

(i) When servicing and/or maintenance is performed by a crew, craft, department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

(ii) Group lockout or tagout devices shall be used in accordance with the procedures required by paragraph (c)(4) of this section including, but not necessarily limited to, the following specific requirements:

(A) Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device (such as an operations lock);

(B) Provision for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment;

(C) When more than one crew, craft, department, etc. is involved, assignment of overall job-associated lockout or tagout control responsibility to an authorized employee designated to coordinate affected work forces and ensure continuity of protection; and

(D) Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

(4) Shift or personnel changes.

Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees, to minimize exposure to hazards from the unexpected energization or start-up of the machine or equipment, or the release of stored energy.

Note: *The following Appendix to 1910.147 serves as a non-mandatory guideline to assist employers and employees in complying with the requirements of this section, as well as to provide other helpful information. Nothing in the appendix adds to or detracts from any of the requirements of this section.*

SUBPART: J 1910.147 App A

Appendix A - Typical minimal lockout procedures (The following simple lockout procedure is provided to assist employers in developing their procedures so they meet the requirements of this standard. When the energy isolating devices are not lockable, tagout may be used, provided the employer complies with the provisions of the standard which require additional training and more rigorous periodic inspections. For more complex systems, more compre-hensive procedures may need to be developed, documented, and utilized.

Lockout Procedure for _____

(Name of Company for single procedure or identification of equipment if multiple procedures are used.)

Purpose.

This procedure establishes the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is done on machines or equipment. It shall be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.

Compliance With This Program.

All employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout. The authorized employees are required to perform the lockout in accordance with this procedure. All employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance shall not attempt to start, energize, or use that machine or equipment. _____ Type of compliance enforcement to be taken for violation of the above.

Sequence of Lockout.

(1) Notify all affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance. _____ Name(s)/Job Title(s) of affected employees and how to notify.

(2) The authorized employee shall refer to the company procedure to identify the type and magnitude of the energy that the machine or equipment utilizes, shall understand the hazards of the energy, and shall know the methods to control the energy. _____ Type(s) and magnitude(s) of energy, its hazards and the methods to control the energy.

(3) If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.). _____ Type(s) and location(s) of machine or equipment operating controls.

(4) De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s). _____ Type(s) and location(s) of energy isolating devices.

(5) Lock out the energy isolating device(s) with assigned individual lock(s).

(6) Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc. Type(s) of stored energy - methods to dissipate or restrain.

(7) Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operated.

Caution: Return operating control(s) to neutral or "off" position after verifying the isolation of the equipment. _____ Method of verifying the isolation of the equipment.

(8) The machine or equipment is now locked out.

Restoring Equipment to Service.

When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken.

(1) Check the machine or equipment and the immediate area around the machine to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.

(2) Check the work area to ensure that all employees have been safely positioned or removed from the area.

(3) Verify that the controls are in neutral.

29 CFR 1910.147
Control of Hazardous Energy
(Lockout/Tagout)
Inspection Procedures
and
Interpretive Guidance

A. Purpose. This instruction establishes policies and provides clarification to ensure uniform enforcement of the Lockout/Tagout Standards.

B. Scope. This instruction applies OSHA-wide.

C. References.

1. General Industry Standards, 29 CFR 1910, Subpart O, Subpart S, and other specific subparts.

D. Effective Date of Requirements. All requirements of 29 CFR 1910.147 have an effective date of April 13, 1990.

E. Background. The Standard for Control of Hazardous Energy (Lockout/Tagout), 29 CFR 1910.147, was promulgated on September 1, 1989, at Federal Register, Volume 54, No. 169 (pages 36644-36696), and was effective on January 2, 1990, as announced at Federal Register, Volume 54, No. 213, November 6, 1989 (page 46610). Previously existing section 29 CFR 1910.147 was redesigned as 29 CFR 1910.150, Sources of Standards. (Kentucky OSH adopted the federal standard, with one (1) amendment (attached). The standard became effective April 13, 1990. It is essential that throughout this directive, compliance officers and consultants be aware of this amendment (i.e. tagout is prohibited by itself when equipment/machinery are capable of being locked out).)

1. Since the inception of its enforcement program, Kentucky OSH has relied on the "General Duty Clause" (KRS Chapter 383.031(1)(a)) to ensure that employers safeguarded their maintenance and service employees through the use of lockout/tagout from the hazards involving the unintentional release of hazardous energy. Such violations reached a level so significant that the development and promulgation of a lockout/tagout standard was required.

2. The new rule addresses practices and procedures that are necessary to disable machinery or equipment and to prevent the release of potentially hazardous energy while maintenance and servicing activities are being performed.

3. The lockout/tagout provisions of this standard are for the protection of general industry workers while performing servicing and maintenance functions and augment the safeguards specified at Subparts O, S, and other applicable portions of 29 CFR 1910.

F. Inspection Guidelines. The standard incorporates performance requirements which allow employers flexibility in developing lockout/tagout programs suitable for their particular facilities.

1. The compliance officer shall determine whether servicing and maintenance operations are performed by the employees. If so, the compliance officer shall further determine whether the servicing and maintenance operations are covered by 29 CFR 1910.147 or by the requirements or employee safeguarding specified by other standards as discussed in G.1.

2. Evaluations of compliance with 29 CFR 1910.147 shall be conducted during all general industry inspections within the scope of the standard in accordance with the FOM, Chapter III, D.7. and 8., Additional Information to Supplement Records Review. The review of records shall include special attention to injuries related to maintenance and servicing operations.

3. The compliance officer or consultant shall evaluate the employer's compliance with the specific requirements of the standard. The following guidance provides a general framework to assist the compliance officer during inspections:

    a. Ask the employer for any hazard analysis or other basis on which the program related to the standard was developed. Although this is not a specific requirement of the standard, such information, when provided, will aid in determining the adequacy of the program. It should be noted that the absence of a hazard analysis does not indicate non-compliance with the standard.

    b. Ask the employer for the documentation including: procedures for the control of hazardous energy including shutdown; equipment isolation; lockout/tagout application; release of stored energy; verification of isolation; certification of periodic inspections; and certification of training. The documented procedure must identify the specific types of energy to be controlled and, in instances where a common procedure is to be used, the specific equipment covered by the common procedure must be identified at least by type and location. The identification of the energy to be controlled may be by magnitude and type of energy. Note the exception to documentation requirements at paragraph 1910.147(c)(4)(i), "Note". The employer need not document the required procedure for a particular machine or equipment when all eight (8) elements listed in the "Note" exist.

    c. Evaluate the employer's training programs for "authorized", affected", and "other" employees. Interview a representative sampling of selected employees as a part of this evaluation (29 CFR 1910.147(c)(7)(i)).

        (1) Verify that the training of authorized employees includes:

            (a) Recognition of hazardous energy;

            (b) Type and magnitude of energy found in the workplace;

            (c) The means and methods of isolating and/or controlling energy; and

            (d) The means of verification of effective energy control, and the purpose of the procedures to be used.

        (2) Verify that affected employees have been instructed in the purpose and use of the energy control procedures.

(3) Verify that all other employees who may be affected by the energy control procedures are instructed about the procedure and the prohibition relating to attempts to restart or reenergize such machines or equipment.

(4) When the employer's procedures permit the use of tagout, (equipment/ machines not capable of being locked out), the training of authorized, affected, and other employees shall include the provisions of 29 CFR 1910.147(c)(7)(ii) and (d)(4)(iii).

d. Evaluate the employer's manner of enforcing the program (29 CFR 1910.147(c)(4)(ii)).

4. In the event that deficiencies are identified by following the guidelines in F.3. of this instruction, the compliance officer shall evaluate the employer's compliance with specific requirements of the standard, with particular attention to the interpretive guidance provided in Section G and to the following:

a. Evaluate compliance with the requirements for periodic inspection of procedures.

b. Ensure that the person performing the periodic inspection is an authorized employee other than the one(s) utilizing the procedure being inspected.

c. Evaluate compliance with retraining requirements which result from the periodic inspection of procedures and practices, or from changes in equipment/processes.

d. Evaluate the employer's procedures for assessment, and correction of deviations of inadequacies identified during periodic inspections of the energy control procedure.

e. Identify the procedures for release from lockout/tagout, including:

(1) Replacement of safeguards, machine or equipment inspection, and removal of nonessential tools and equipment;

(2) Safe positioning of employees;

(3) Removal of lockout/tagout device(s); and

(4) Notification of affected employees that servicing and maintenance is completed.

f. Ensure that when group lockout or tagout is used, it affords a level of protection equivalent to individual lockout or tagout as amplified in G.7. through 5.9. of this instruction.

5. The lockout/tagout standard is a performance standard; therefore, additional guidance is provided in Appendix C of this instruction to assist in effective implementation by employers and for uniform enforcement by OSHA field staff.

G. Interpretive Guidance. The following guidance relative to specific provisions of 29 CFR

1910.147 is provided to assist compliance officers in conducting inspections where the standard may be applicable:

1. Scope of the Standard.

   a. The standard as specified in 29 CFR 1910.147(b), applies to any source of mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

      (1) The standard applies to piping systems, and requires, at 29 CFR 1910.147(d)(5), that all potentially hazardous stored or residual energy be relieved, disconnected, restrained, and otherwise rendered safe. If there is a possibility of reaccumulation of stored energy to a hazardous level, continued monitoring shall be performed while a potential hazard exists.

      (2) The standard also applies to high intensity electromagnetic fields regulated at 29 CFR 1910.97, nonionizing radiation. Such electromagnetic devices shall be deenergized and held off whenever workers are present within a high intensity ambient field.

      (3) Servicing/maintenance of fire alarm and extinguishing systems and their components, upon which other employees are dependent for fire safety, are not required to meet the requirements of this standard if the workers performing servicing/maintenance upon fire extinguishing systems are protected from hazards related to the unexpected release of hazardous energy by appropriate alternative measures. (See 29 CFR 1910, Subpart L.)

   b. The standard does not apply to servicing and maintenance when employees are not exposed to the unexpected release of hazardous energy.

   c. Safeguarding workers from the hazards of contacting electrically live parts (exposure to electric current) continues to be regulated at Subpart S.

   d. Servicing and maintenance functions conducted during normal production operations are not regulated at 29 CFR 1910.147 if the safeguarding provisions of Subpart O or other applicable portions of 29 CFR 1910 prevent worker exposure to hazards created by the unexpected energization or start-up of the machine or equipment. However, lockout/tagout procedures are required if the production safeguards are rendered ineffective while an employee is exposed to hazardous portions of the machines or equipment.

   e. Generally, activities such as lubrication, cleaning or unjamming, servicing of machines or equipment, and making adjustments or tool changes, where the employee may be exposed to the UNEXPECTED energization or start-up of the equipment or release of hazardous energy, are covered by this standard. However, minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered by this standard if they are routine, repetitive, and integral to the use of equipment for production, and if work is performed using alternative protective measures which provide effective employee protection. Thus, lockout or tagout is not required by this standard if the alternative protective measures enable the servicing employee to clean or unjam, or otherwise service the machine without being exposed to unexpected energization or

activation of the equipment, or the release of stored energy.

NOTE: Appendix C, Section A, provides further guidance in this area.

f. The exclusion of plug and cord connected electric equipment, at 29 CFR 1910.147(a)(2)(iii)(A), applies only when the equipment is unplugged and plus is under the exclusive control of the employee performing the servicing and/or maintenance.

(1) The plug is under the exclusive control of the employee if it is physically in the possession of the employee, or in arm's reach and in line of sight of the employee, or if the employee has affixed a lockout/tagout device on the plug.

(2) The company lockout/tagout procedures required by t he standard at 29 CFR 1910.147(c)(4) shall specify the acceptable procedure for handling cord and plug connected equipment.

2. Procedures.

a. The employer must develop and document procedures and techniques to be used for the control of hazardous energy. The standard, at 29 CFR 1910.147 (c)(4)(i) "Note," identifies eight (8) conditions that must exist in order to excuse the employer's obligation to maintain a written procedure for a specific machine or piece of equipment.

b. 29 CFR 1910.147(d)(3) and (d)(5) provide that energy isolation be a mandatory part of employer's control procedure where either a lockout system or a tagout system is used.

c. Similar machines and/or equipment (such as those using the same type and magnitude of energy and the same or similar types of controls) can be covered with a single written procedure.

3. Lockout vs. Tagout.

a. Kentucky OSH has determined that lockout is a surer means of ensuring deenergization of equipment than tagout, and that it is required when achievable (see attached amendment to federal OSHA standard).

b. 29 CFR 1910.147(c)(4)(ii) provides that: Where lockout/tagout programs are used, the employer is required to implement an effective means of enforcing the program.

c. 29 CFR 1910.147(c)(7)(ii)(A-F) provide that: Additional training of authorized, affected and other employees is required when tagout programs are used.

d. 29 CFR 1910.147(c)(5)(ii)(A) requires that lockout and tagout devices be capable of withstanding the environment to which they are exposed. Devices which are not exposed to harsh environments need not be capable of withstanding such exposure.

e. 29 CFR 1910.147(c)(5)(ii)(C)(2) requires that tagout devices having reusable, non-locking, easily detachable means of attachment (such as string, cord, or adhesive) are not permitted.

4. Employees and Training.

a. The standard recognized three types of employees: (1) "authorized" and (2) "affected", defined in 1910.47(b), and (3) "other", defined in 1910.147(c)(7)(ii)(C). Different levels of training are required based upon the respective roles of employees in the control of energy and the knowledge which they must possess to accomplish their tasks safely and to ensure the safety of fellow workers as related to the lockout/tagout procedures (1910.147(c)(7)(i)).

b. Employees who exclusively perform functions related to normal production operations, and who perform servicing and/or maintenance under the protection of normal machine safeguarding, need only be trained as "affected" (rather than "authorized") employees even if tagout procedures are used. (See, G.1.d. and G.1.e. of this instruction.)

c. The employer's training program must cover, at a minimum, the following three areas: energy control program, elements of energy control procedures relevant to employee duties, and the pertinent requirements of the standard (1910.147(c)(7) and (d) through (f)).

d. The employer must provide:

(1) Effective initial training;

(2) Effective retraining as needed; and

(3) Certification of training. The certification shall contain each employee's name and dates of training (1910.147(c)(7)(iv)).

e. Retraining of authorized and affected employees is required:

(1) Whenever there is a change in employee job assignments;

(2) Whenever a new hazard is introduced due to change in machines, equipment or process;

(3) Whenever there is a change in the energy control procedures; or

(4) Whenever a periodic inspection by the employer reveals inadequacies in the company procedures or in the knowledge of the employees.

5. Periodic Inspection by the Employer.

a. At least annually, the employer shall ensure that an authorized employee other than the one(s) utilizing the energy control procedure being inspected, is required to inspect and verify the effectiveness of the company energy control procedures. These inspections shall at least provide for a demonstration of the procedures and may be implemented through random audits and planned visual observations. These inspections are intended to ensure that the energy

control procedures are being properly implemented and to provide an essential check on the continued utilization of the procedures (29 CFR 1910.147(c)(6)(i)).

(1) When lockout is used, the employer's inspection shall include a review of the responsibilities of each authorized employee implementing the procedure with that employee. Group meetings between the authorized employee who is performing the inspection and all authorized employees who implement the procedure would constitute compliance with this requirement.

(2) When tagout is used, the employer shall conduct this review with each affected and authorized employee.

(3) Energy control procedures used less frequently than once a year need be inspected only when used.

b. The periodic inspection must provide for and ensure effective correction of identified deficiencies (29 CFR 1910.147(c)(6)(i)(B)).

c. The employer is required to certify that the prescribed periodic inspections have been performed (29 CFR 1910.147(c)(6)(ii)).

6. Equipment Testing or Positioning.

Under 29 CFR 1910.147(f)(1), Kentucky OSH allows the temporary removal of lockout or tagout devices and the reenergization of the machine or equipment ONLY during the limited time necessary for the testing or positioning of machines, equip-ment or components. After the completion of the temporary reenergization, the authorized employees shall again deenergize the equipment and resume lockout/tagout procedures.

7. Group Lockout/Tagout.

Group lockout/tagout procedures shall be tailored to the specific industrial operation and may be unique in the manner that employee protection from the release of hazardous energy is achieved. Irrespective of the situation, the requirements of this generic standard specify that each employee performing maintenance or servicing activities shall be in control of hazardous energy during his/her period of exposure.

a. Group operations normally require that a lockout/tagout program be implemented which ensures that each authorized employee is protected from the unexpected release of hazardous energy by his/her personal lockout/ tagout device(s). No employee may affix the personal lockout/tagout device of another employee. Various group lockout/tagout procedures discussed in Appendix C provide for each authorized employee's use of his/her personal lockout/tagout device(s).

b. One of the most difficult problems addressed by the standard involves the servicing and maintenance of complex equipment. Such equipment is frequently used in the petrochemical and chemical industries. Acceptable group lockout/tagout procedures for complex equipment are discussed further

at Appendix C.

8. Compliance with Group Lockout/Tagout.

These operations shall, at a minimum, provide for the following:

a. Before the machine or equipment is shut down, each authorized employee who is to be involved during the servicing/maintenance operation shall be made aware by the employer of the type, magnitude, and hazards related to the energy to be controlled and of the method or means to control the energy. In the event that the machine or equipment is already shut down, the authorized employee shall be made aware of these elements before beginning his/her work (29 CFR 1910.147(d)(1)). Verification shall be performed as noted at G.8.f. of this instruction.

b. An orderly shutdown of the machine or equipment shall be conducted which conforms to the documented company procedure and which will not create hazards (29 CFR 1910.147(d)(2)).

c. All energy isolating devices needed to isolate the machine or equipment shall be effectively positioned and/or installed (29 CFR 1910.147(d)(3)).

d. The authorized employee(s) performing the servicing or maintenance (following the company procedure) shall personally affix a lock or tag upon each energy isolating device (29 CFR 1910.147(d)(4)(i)). The company procedure must ensure that no employee affixes a personal lockout/tagout device for another employee.

(1) A single lock upon each energy isolating device, together with the use of a lockbox for retention of the keys and to which each authorized employee affixes his/her personal lock or tag, also satisfies the require- ment (29 CFR 1910.147(f)(3)(i)).

(2) Locks shall be affixed in a manner that will hold the energy isolating device in a safe (off) position (29 CFR 1910.147(d)(4)(ii)).

(3) Tagout devices, where used, shall be affixed at the same location as would a lock if such fittings are provided, or shall be affixed in a manner that will clearly indicate that movement of the isolating device is prohibited (29 CFR 1910.147(d)(4)(iii)).

e. Following the application of locks or tags, all potentially hazardous stored energy or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe (29 CFR 1910.147(d)(5)(i)).

(1) Verification of energy isolation shall be monitored as frequently as necessary if there is a possibility of reaccumulation of stored energy (29 CFR 1910.147(d)(5)(ii)).

(2) Monitoring may be accomplished, for example, by observation or with the aid of a monitoring device which will sound an alarm if a hazardous energy level is being approached.

f. Authorized employees shall verify that isolation and deenergization have been effectively accomplished before starting servicing/maintenance work. Verification is also necessary by each group of workers before starting work at shift changes.

g. Release from lockout/tagout shall be accomplished in compliance with the requirements at 29 CFR 1910.147(e).

(1) The machine or equipment area shall be cleared of nonessential items to prevent malfunctions which could result in employee injuries (29 CFR 1910.147(e)(1)).

(2) The authorized employees shall remove their respective locks or tags from the energy isolating devices or from the group lock-box(es) following the procedure established by the company (29 CFR 1910.147(e)(3)).

(3) In all instances, the company procedure must provide a system which identifies each authorized employee involved in the servicing/ maintenance operation.

(4) Before reenergization, all employees in the machine or equipment area shall be safely positioned or moved from the area, and the affected employees shall be notified that the lockout/tagout devices have been removed (29 CFR 1910.147(e)(2)).

h. During all group lockout/tagout operations where the release of hazardous energy is possible, each authorized employee performing servicing or maintenance shall be protected by his/her personal lockout or tagout device and by the company procedure. As described at Appendix C, B.1.g., a master tag is a personal tagout device if each employee personally signs on and signs off on it and if the tag clearly identifies each authorized employee who is being protected by it.

9. Compliance of Outside Personnel.

Outside servicing and maintenance personnel (contractors, etc.) engaged in activities regulated under 29 CFR 1910.147 are subject to the requirements of that standard.

a. The compliance officer or consultant shall verify that the outside employer and the on-site employer have exchanged information regarding the lockout/ tagout energy control procedures used by each employer's workers (29 CFR 1910.147(f)(2)(i)).

b. The compliance officer or consultant shall verify that the on-site employer has effectively informed his/her personnel of the restrictions and prohibitions associated with the outside employer's energy control procedures (29 CFR 1910.147(f)(2)(ii)).

c. When an outside employer is engaged in servicing and maintenance activities with an on-site employer's facility and if that contractor's activities are subject to the requirements of 29 CFR 1910.147, the compliance officer or consultant shall coordinate with his/her supervisor to obtain permission to initiate an independent inspection of the outside contractor's activities.

10. Appendix B contains an example of a functional flow diagram to implement safe lockout/tagout procedures. This flow diagram is presented solely as an aid and does not constitute the exclusive or definitive means of complying with the standard in any particular situation.

H. Classification of Violations.

1. A deficiency in the employer's energy control program and/or procedure that could contribute to a potential exposure capable of producing serious physical harm or death shall be cited as a serious violation.

2. The failure to train "authorized", "affected", and "other" employees as required for their respective classifications should normally be cited as a serious violation.

3. Paperwork deficiencies in lockout/tagout programs where effective lockout/tagout work procedures are in place shall be cited as other-than serious.

APPENDIX A

SOME EXISTING OSHA STANDARDS RELATED TO LOCKOUT, TAGOUT,
OR THE CONTROL OF ENERGY DURING MAINTENANCE

NOTE: THE INFORMATION IN THIS APPENDIX IS INTENDED ONLY AS A GUIDE AND DOES NOT PURPORT TO BE A COMPLETE LISTING OF ALL RELATED REGULATIONS/STANDARDS ON THIS SUBJECT

General Industry Lockout Related

Standard Provisions

SPECIFICATIONS FOR ACCIDENT PREVENTION SIGNS AND TAGS

No.	STANDARD
1910.145(f)(1)	(i) The tags are a temporary means of warning all concerned of a hazardous condition, defective equipment, radiation hazards, etc. The tags are not to be considered as a complete warning method, but should be used until a positive means can be employed to eliminate the hazard; for example, a "Do Not Start" tag on power equipment shall be used for a few moments or a very short time until the switch in the system can be locked out; a "Defective Equipment" tag shall be placed on a damaged ladder and immediate arrangements made for the ladder to be taken out of service and sent to the repair shop.
1910.145(f)(3)(iii)	"Do Not Start" tags shall be placed in a conspicuous location or shall be placed in such a manner that they effectively block the starting mechanism which would cause hazardous conditions should the equipment be energized.
1910.145(f)(4)(i)	Danger tags should be used only where an immediate hazard exists. There should be no variation in the type of design of tags posted or hung to warn of specific dangers.
1910.145(f)(5)	(i) Caution tags should be used only to warn against potential hazards or to caution against unsafe practices.
1910.145(f)	(6) Out of order tags. "Out of Order" tags should be used only for the specific purpose of indicating that a piece of equipment, machinery, etc., is out of order and to attempt to use it might present a hazard.

CONFINED SPACES

1910.146(f)(8)	The measures used to isolate the permit space and to eliminate or control permit space hazards before entry. ***NOTE:*** Those measures can include the lockout or tagging of equipment and procedures for purging, inerting, ventilating and flushing permit spaces.

POWERED INDUSTRIAL TRUCKS

1910.178(q)	(4) Trucks in need of repairs to the electrical system shall have the battery disconnected prior to such repairs.

OVERHEAD AND GANTRY CRANES

1910.179(g)(5)(i) The power supply to the runway conductors shall be controlled by a switch or circuit breaker located on a fixed structure, accessible from the floor, and arranged to be locked in the open position.

(ii) On cab-operated cranes, a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from the runway conductors. A means of opening this switch or circuit breaker shall be located within easy reach of the operator.

(iii) On floor-operated cranes, a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from runway conductors. This disconnect shall be mounted on the bridge or footwalk near the runway collectors. One of the following types of floor-operated disconnects shall be provided:

1910.179(l)(2) (i) Before adjustments and repairs are started on a crane the following precautions shall be taken:

(b) All controllers shall be at the "off" position.

(c) The main or emergency switch shall be opened and locked in the open position.

(d) Warning or "out of order" signs shall be placed on the crane, also on the floor beneath or on the hook where visible from the floor.

DERRICKS

1910.181(f)(2)(i) (c) The main or emergency switch shall be locked in the open position, if an electric hoist is used.

(d) Warning or "out of order" signs shall be placed on the derrick and hoist.

WOODWORKING MACHINERY REQUIREMENTS

1910.213(a) (10) It is recommended that each power-driven woodworking machine be provided with a disconnect switch that can be locked in the "off" position.

1910.213(b) (3) On applications where injury to the operator might result if motors were to restart after power failures, provisions shall be

made to prevent machines from automatically restarting upon restoration of power.

1910.213(b) (5) On each machine operated by electric motors, positive means shall be provided for rendering such controls or devices inoperative while repairs or adjustments are being made to the machines they control.

MECHANICAL POWER PRESSES

1910.217(b)(8)(i) A main power disconnect switch capable of being locked only in the "Off" position shall be provided with every power press control system.

1910.217(d)(9) (iv) The employer shall provide and enforce the use of safety blocks for use whenever dies are being adjusted or repaired in the press.

FORGING MACHINES

1910.218(a)(3) (iii) Means shall be provided for disconnecting the power to the machine and for locking out or rendering cycling controls inoperable.

(iv) The ram shall be blocked when dies are being changed or other work is being done on the hammer. Blocks or wedges shall be made of material the strength and construction of which should meet or exceed the specifications and dimensions shown in Table 0-11.

1910.218(d) (2) Shutoff valve. Steam hammers shall be provided with a quick closing emergency valve in the admission pipe line at a convenient location. This valve shall be closed and locked in the "off" position while the hammer is being adjusted, repaired, or serviced, or when the dies are being changed.

1910.218(e)(1)(ii) Air-lift hammers shall have an air shutoff valve as required in paragraph (d)(2) of this section and should be conveniently located and distinctly marked for ease of identification.

(iii) Air-lift hammers shall be provided with two drain cocks: one on main head cylinder, and one on clamp cylinder.

1910.218(f) (1) Mechanical forging presses. When dies are being changed or maintenance is being performed on the press, the following shall be accomplished:

(i) The power to the press shall be locked out.

(ii) The flywheel shall be at rest.

	(iii) The ram shall be blocked with a material the strength of which shall meet or exceed the specifications or dimensions shown in Table 0-11.
1910.218(f)	(2) Hydraulic forging presses. When dies are being changed or maintenance is being performed on the press, the following shall be accomplished: (i) The hydraulic pumps and power apparatus shall be locked out. (ii) The ram shall be blocked with a material the strength of which shall meet or exceed the specifications or dimensions shown in Table 0-11.
1910.218(g)	(1) Hot trimming presses. The requirements of paragraph (f)(1) of this section shall also apply to hot trimming presses.
1910.218(h)	(2) Lockout. Upsetters shall be provided with a means for locking out the power at its entry point to the machine and rendering its cycling controls inoperable. (5) Changing dies. When dies are being changed, maintenance performed, or any work done on the machine, the power to the upsetter shall be locked out, and the flywheel shall be at rest.
1910.218(i)	(1) Boltheading. The provisions of paragraph (h) of this section shall apply to boltheading. (2) Rivet making. The provisions of paragraph (h) of this section shall apply to rivet making.
1910.218(j)	(1) Billet shears. A positive-type lockout device for disconnecting the power to the shear shall be provided.

WELDING, CUTTING, AND BRAZING

1910.252(c)(1)	(i) Installation. All equipment shall be installed by a qualified electrician in conformance with Subpart S of this part. There shall be a safety-type disconnecting switch or a circuit breaker or circuit interrupter to open each power circuit to the machine, conveniently located at or near the machine, so that the power can be shut off when the machine or its controls are to be serviced.
1910.252(c)(2)	(ii) Capacitor welding. Stored energy or capacitor discharge type of resistance welding equipment and control panels involving high voltage (over 550 volts) shall be suitably insulated and protected by complete enclosures, all doors of which shall be provided with suitable interlocks and contacts wired into the control circuit (similar to elevator interlocks). Such interlocks or contacts shall be so designed as to effectively interrupt power and short circuit all capacitors when the door or panel is open. A manually operated switch or suitable positive device shall be installed, in addition to

the mechanical interlocks or contacts, as an added safety measure assuring absolute discharge of all capacitors.

PULP, PAPER AND PAPERBOARD MILLS

1910.261(b) (4) Lockouts. Devices such as padlocks shall be provided for locking out the source of power at the main disconnect switch. Before any maintenance, inspection, cleaning, adjusting, or servicing of equipment (electrical, mechanical, or other) that requires entrance into or close contact with the machinery or equipment, the main power disconnect switch or valve, or both, controlling its source of power or flow of material, shall be locked out or blocked off with padlock, blank flange, or similar device.

(5) Vessel entering. Lifelines and safety harness shall be worn by anyone entering closed vessels, tanks, ship bins, and similar equipment, and a person shall be stationed outside in a position to handle the line and to summon assistance in case of emergency. The air in the vessels shall be tested for oxygen deficiency and the presence of both toxic and explosive gases and vapors, before entry into closed vessels, tanks, etc., is permitted. Self-contained air or oxygen-supply masks shall be readily available in case of emergency. Work shall not be done on equipment under conditions where an injury would result if a valve were unexpectedly opened or closed unless the valve has been locked in a safe position.

1910.261(e) (2) Slasher tables. Saws shall be stopped and power switches shall be locked out and tagged whenever it is necessary for any person to be on the slasher table.

(10) Stops. All control devices shall be locked out and tagged when knives are being changed.

1910.261(e)(12)(iii) Whenever it becomes necessary for a workman to go within a drum, the driving mechanism shall be locked and tagged, at the main disconnect switch, in accordance with paragraph (b)(4) of this section.

1910.261(e) (13) Intermittent barking drums. In addition to motor switch, clutch, belt shifter, or other power disconnecting device, intermittent barking drums shall be equipped with a device which may be locked to prevent the drum from moving while it is being emptied or filled.

1910.261(f)(6) (i) When cleaning, inspection, or other work requires that persons enter rag cookers, all steam and water valves, or other control devices, shall be locked and tagged in the closed or "off" position. Blank flanging of pipelines is acceptable in place of closed and locked valves.

1910.261(g)(4)(ii) A man shall be stationed outside to summon assistance if necessary. All intake valves to a tank shall be blanked off or

disconnected.

1910.261(g)(15) (i) Valves controlling lines leading into a digester shall be locked out and tagged. The keys to the locks shall be in the possession of a person or persons doing the inspecting or making repairs.

1910.261(g)(16) (i) Safety regulations governing inspection and repairing of pressure tanks-accumulators (acid) shall be the same as those specified in subparagraph (15) of this paragraph.

1910.261(g)(19) (iii) When blow lines from more than one digester lead into one pipe, the cock or valve of the blow line from the tank being inspected or repaired shall be locked or tagged out, or the line shall be disconnected and blocked off.

1910.261(g)(21) Inspection and repair of tanks. All piping leading to tanks shall be blanked off or valved and locked or tagged. Any lines to sewers shall be blanked off to protect workers from air contaminants.

1910.261(j)(1) (iii) Repairs for cleaning of blockage shall be done only when the shredder is shutdown and control devices locked.

1910.261(j)(4) (iii) When cleaning, inspecting, or other work requires that persons enter the beaters, all control devices shall be locked or tagged out, in accordance with paragraph (b)(4) of this section.

1910.261(j)(6)(i) All control devices shall be locked or tagged out when persons enter stock chests, in accordance with paragraph (b)(4) of this section.

1910.261(j)(5) (iii) When cleaning, inspecting, or other work requires that persons enter pulpers, all steam, water, or other control devices shall be locked or tagged out. Blank flanging and tagging of pipe lines are acceptable in place of closed and locked or tagged valves. Blank flanging of steam and water lines shall be acceptable in place of valve locks.

1910.261(k)(2)(ii) All drives shall be provided with lockout devices at the power switch which interrupts the flow of current to the unit.

TEXTILES

1910.262(c) (1) Means of stopping machines. Every textile machine shall be provided with individual mechanical or electrical means for stopping such machines. On machines driven by belts and shafting, a locking-type shifter or an equivalent positive device shall be used. On operations where injury to the operator might result if motors were to restart after failures, provisions shall be made to prevent machines from automatically restarting upon restoration of power.

1910.262(n) (2) Protection for loom fixer. Provisions shall be made so that

every loom fixer can prevent the loom from being started while he is at work on the loom. This may be accomplished by means of a lock, the key to which is retained in the possession of the loom fixer, or by some other effective means to prevent starting the loom.

1910.262(p) (1) J-box protection. Each valve controlling the flow of steam, injurious gases, or liquids into a J-box shall be equipped with a chain, lock, and key, so that any worker who enters the J-box can lock the valve and retain the key in his possession. Any other method which will prevent steam, injurious gases, or liquids from entering the J-box while the worker is in it will be acceptable.

1910.262(q) (2) Kier valve protection. Each valve controlling the flow of steam, injurious gases, or liquids into a kier shall be equipped with a chain, lock, and key, so that any worker who enters the kier can lock the valve and retain the key in his possession. Any other method which will prevent steam, injurious gases, or liquids from entering the kier while the worker is in it will be acceptable.

BAKERY EQUIPMENT

1910.263(k)(12) (i) Where pan cooling towers extend to two or more floors, a lockout switch shall be provided on each floor in order that mechanics working on the tower may positively lock the

mechanism against starting. Only one start switch shall be used in the motor control circuit.

1910.263(l)(3)(iii) (b) Main shutoff valves shall be locked in the closed position when men must enter the oven or when the oven is not in service.

1910.263(l)(8) (iii) A main disconnect switch or circuit breaker shall be provided. This switch or circuit breaker shall be so located that it can be reached quickly and safely.

The main switch or circuit breaker shall have provisions for locking it in the open position if any work on the electrical equipment or inside the oven must be performed.

SAWMILLS

1910.265(c)(12)(v) Open switches. Before working on electrical equipment, switches shall be open and shall be tagged, blocked, or locked out.

1910.265(c) (13) Hydraulic systems. Means shall be provided to block, chain, or otherwise secure equipment normally supported by hydraulic pressure so as to provide for safe maintenance.

1910.265(c)(26) (iii) Blocking hoisting platform. Means shall be provided to positively block the hoisting platform when employees must go

	beneath the stacker or unstacker hoist.
	(v) Locking main control switches. Main control switches shall be so designed that they can be locked in the open position.
1910.265(e)(1)	(iv) Carriage control. A positive means shall be provided to prevent unintended movement of the carriage. This may involve a control locking device, a carriage tie-down, or both.
1910.268(l)	(2) Before the voltage is applied, cable conductors shall be isolated to the extent practicable. Employees shall be warned, by such techniques as briefing and tagging at all affected locations, to stay clear while the voltage is applied.
1910.268(m)(7)	(i) Prior to grounding a radio transmitting station antenna, the employer shall insure that the rigger in charge: (A) Prepares a danger tag signed with his signature, (B) Requests the transmitting technician to shutdown the transmitter and to ground the antenna with its grounding switch, (C) Is notified by the transmitting technician that the transmitter has been shutdown, and (D) Tags the antenna ground switch personally in the presence of the transmitting technician after the antenna has been grounded by the transmitting technician.
1910.309 NEC Article 430-86 (a)	Motor Not in Sight from Controller. Where a motor and the driven machinery are not in sight from the controller location, the installation shall comply with one of the following conditions:
	(a) The controller disconnecting means is capable of being locked in the open position.
1910.333(b)	(2) Lockout and tagging. While any employee is exposed to contact with parts of fixed electric equipment or circuits which have been deenergized, the circuits energizing the parts shall be locked out or tagged or both, in accordance with the requirements of this paragraph. The requirements shall be followed in the order in which they are presented (i.e., paragraph (b)(2)(i) first, then paragraph (b)(2)(ii), etc.).
	NOTE 1: As used in this section, fixed equipment refers to equipment fastened in place or connected by permanent wiring methods.
	NOTE 2: Lockout and tagging procedures that comply with paragraphs (c) through (f) of §1910.147 will also be deemed to comply with paragraph (b)(2) of this section provided that:
	(1) The procedures address the electrical safety hazards covered by this Subpart; and
	(2)The procedures also incorporate the requirements of paragraphs (b)(2)(iii) (D) and (b)(2)(iv)(B) of this section.

1910.333(b)(2)(iii)	(a) Applications of Locks and Tags. A lock and a tag shall be placed on each disconnecting means used to deenergize circuits and equipment on which work is to be performed, except as provided in paragraphs (b)(2)(iii)(C) and (b)(2) (iii)(E) of this section. The lock shall be attached so as to prevent persons from operating the disconnecting means unless they resort to undue force or the use of tools.

GENERAL SAFETY AND HEALTH PROVISIONS

1926.20(b)	(3) The use of any machinery, tool, material or equipment which is not in compliance with any applicable requirement of this part is prohibited. Such machine, tool, material, or equipment shall either be identified as unsafe by tagging or locking the controls to render them inoperable or shall be physically removed from its place of operation.

NONIONIZING RADIATION

1926.54	(e) Beam shutters or caps shall be utilized, or the laser turned off, when laser transmission is not actually required. When the laser is left unattended for a substantial period of time, such as during lunch hour, overnight, or at change of shifts, the laser shall be turned off.

FIRE PROTECTION AND PREVENTION

1926.150(d)(1)	(ii) During demolition or alterations, existing automatic sprinkler installations shall be retained in service as long as reasonable. The operation of sprinkler control valves shall be permitted only by properly authorized persons. Modification of sprinkler systems to permit alterations or additional demolition should be expedited so that the automatic protection may be returned to service as quickly as possible. Sprinkler control valves shall be checked daily at close of work to ascertain that the protection is in service.
1926.200(h)	(1) Accident prevention tags shall be used as a temporary means of warning employees of an existing hazard, such as defective tools, equipment, etc. They shall not be used in place of, or as a substitute for, accident prevention signs. (2) Specifications for accident prevention tags similar to those in Table G-1 shall apply.
1926.304	(a) All fixed power driven woodworking tools shall be provided with a disconnect switch that can either be locked or tagged in the off position.

WELDING AND CUTTING

1926.352

(g) For the elimination of possible fire in enclosed spaces as a result of gas escaping through leaking or improperly closed torch valves, the gas supply to the torch shall be positively shut off at some point outside the enclosed space whenever the torch is not to be used or whenever the torch is left unattended for a substantial period of time, such as during the lunch period. Overnight and at the change of shifts, the torch and hose shall be removed from the confined space. Open end fuel gas and oxygen hoses shall be immediately removed from enclosed spaces when they are disconnected from the torch or other gas-consuming device.

ELECTRICAL-GENERAL REQUIREMENTS

1926.400(g)

(1) Equipment or circuits that are deenergized shall be rendered inoperative and have tags attached at all points where such equipment or circuits can be energized.

(2) Controls that are to be deactivated during the course of work on energized or deenergized equipment or circuits shall be tagged.

(3) Tags shall be placed to identify plainly the equipment or circuits being worked on.

BASE-MOUNTED DRUM HOISTS

1926.553(a)(3)(i)

A device to disconnect all motors from the line upon power failure and not permit any motor to be restarted until the controller handle is brought to the "off" position.

(iii) A means whereby remotely operated hoists stop when any control is ineffective.

CONVEYORS

1926.555(a)

(7) Conveyors shall be locked out or otherwise rendered inoperable, and tagged out with a "Do Not Operate" tag during repairs and when operation is hazardous to employees performing maintenance work.

MOTOR VEHICLES, MECHANIZED EQUIPMENT, AND MARINE OPERATIONS

1926.600(a)(3)

(i) Heavy machinery, equipment, or parts thereof, which are suspended or held aloft by use of slings, hoists, or jacks shall be substantially blocked or cribbed to prevent falling or shifting before

	employees are permitted to work under or between them. Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment, shall be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the motors stopped and brakes set, unless work being performed requires otherwise.
1926.600(a)(3)	(ii) Whenever the equipment is parked, the parking brake shall be set. Equipment parked on inclines shall have the wheels chocked and the parking brake set.
1926.601(b)	(10) Trucks with dump bodies shall be equipped with positive means of support, permanently attached, and capable of being locked in position to prevent accidental lowering of the body while maintenance or inspection work is being done.
	(11) Operating levers controlling hoisting or dumping devices on haulage bodies shall be equipped with a latch or other device which will prevent accidental starting or tripping of the mechanism.
1926.603(a)	(5) A blocking device, capable of safely supporting the weight of the hammer, shall be provided for placement in the leads under the hammer at all times while employees are working under the hammer.

INITIATION OF EXPLOSIVE CHARGES-ELECTRICAL BLASTING

1926.906	(j) In underground operations when firing from a power circuit, a safety switch shall be placed in the permanent firing line at intervals. This switch shall be made so it can be locked only in the "Off" position and shall be provided with a short-circuit arrangement of the firing lines to the cap circuit.
	(l) When firing from a power circuit, the firing switch shall be locked in the open or "Off" position at all times, except when firing. It shall be so designed that the firing lines to the cap circuit are automatically short-circuited when the switch is in the "Off" position. Keys to this switch shall be entrusted only to the blaster.

POWER TRANSMISSION AND DISTRIBUTION

1926.950	(d) Deenergizing lines and equipment.
	(l) When deenergizing lines and equipment operated in excess of 600 volts, and the means of disconnecting from electric energy is not visibly open or visibly locked out, the provisions of subdivisions (i) through (vii) of this subparagraph shall be complied with:
	(i) The particular section of line or equipment to be deenergized shall be clearly identified, and it shall be isolated from all sources of voltage.

(ii) Notification and assurance from the designated employee shall be obtained that:

(a) All switches and disconnectors through which energy may be supplied to the particular section of line or equipment to be worked have been deenergized;

(b) All switches and disconnectors are plainly tagged indicating that men are at work;

(c) And that where design of such switches and disconnectors permits, they have been rendered inoperable.

(iii) After all designated switches and disconnectors have been opened, rendered inoperable, and tagged, visual inspection or tests shall be conducted to insure that equipment or lines have been deenergized.

(iv) Protective grounds shall be applied on the disconnected lines or equipment to be worked on.

(v) Guards or barriers shall be erected as necessary to adjacent energized lines.

(vi) When more than one independent crew requires the same line or equipment to be deenergized, a prominent tag for each such independent crew shall be placed on the line or equipment by the designated employee in charge.

(vii) Upon completion of work on deenergized lines or equipment, each designated employee in charge shall determine that all employees in his crew are clear, that protective grounds installed by his crew have been removed, and he shall report to the designated authority that all tags protecting his crew may be removed.

(2) When a crew working on a line or equipment can clearly see that the means of disconnecting from electric energy are visibly open or visibly locked-out, the provisions of subdivisions (i) and (ii) of this subparagraph shall apply:

(i) Guards or barriers shall be erected as necessary to adjacent energized lines.

(ii) Upon completion of work on deenergized lines or equipment, each designated employee in charge shall determine that all employees in his crew are clear, that protective grounds installed by his crew have been removed, and he shall report to the designated authority that all tags protecting his crew may be removed.

1926.957	(b) Deenergized equipment or lines. When it is necessary to deenergize equipment or lines for protection of employees, the requirements of paragraph 1926.950(d) shall be complied with.

APPENDIX B

This flow diagram does not constitute the exclusive or definitive means of complying with the standard in any particular situation and is presented solely as an aid.

EXAMPLE - FUNCTIONAL FLOW DIAGRAM FOR IMPLEMENTATION OF LOCKOUT/TAGOUT REQUIREMENTS

APPENDIX C

This appendix provides guidelines to assist the compliance officer during evaluations of employer operations.

A. Normal Production Operations. The lockout/tagout standard, 29 CFR 1910.147, addresses the safety of employees engaged in servicing and maintenance activities in general industry workplaces. The standard complements the requirements for machine and process operator safety prescribed by the various general industry standards in 29 CFR Part 1910. Subpart O of 29 CFR 1910 provides the principal, though not exclusive, machine guarding requirements.

1. Safeguarding of servicing and maintenance workers can be ensured either by:

   a. Effective machine safeguarding in compliance with Subpart O, or

   b. Compliance with 29 CFR 1910.147 in situations where the normal production operations safeguards are rendered ineffective or do not protect the servicing/maintenance worker.

2. Activities which are routine, repetitive, and integral to the use of equipment for production are not covered by this standard if alternative measures provide effective worker protection from hazards associated with unexpected energization. Compliance with the machine guarding requirements of Subpart O is an example of such alternative measures. In addition, supplemental personal protective equipment may be necessary during a servicing or maintenance operation when a toxic substance is to be isolated. Under such circumstances, the requirements of applicable standards, such as 29 CFR 1910.134 and Subpart Z, also must be met.

3. An employer who requires employees to perform routine maintenance and/or servicing while a machine or process is operating in the production mode, must provide employee safeguarding under the applicable requirements of Subpart O. (Ref. 29 CFR 1910.212(a)(1)). Operations such as lubricating, draining sumps, servicing of filters, and inspection for leaks and/or mechanical malfunction are examples of routine operations which can be accomplished with effective production-mode safeguards. However, the replacement of machine or process equipment components such as valves, gauges, linkages, support structure, etc., is not considered to be normal routine maintenance function which can safely be accomplished during machine or process equipment operation. Such maintenance requires energy isolation and should be evaluated by OSHA field staff. They also may be an appropriate subject of a variance request.

4. Several alternative means of safeguarding the hazardous portions of machines and equipment are presented by the national consensus standard, ANSI B11.19-1990. Although that standard is not all inclusive, it describes effective safeguarding alternatives for the protection of employees. The safeguards described include: interlocked barrier guards,

presence sensing devices and various devices under the exclusive control of the employee. Such devices or guards, properly applied, may be used in clearing minor jams and performing other minor servicing functions which occur during normal production operations and which meet the criteria described in paragraph A.2. of this appendix.

B. Group Lockout/Tagout. The group lockout/tagout procedures described in this instruction at paragraph G.8. require each authorized employee to be in control of potentially hazardous energy release during their servicing/maintenance work assignments. Under most circumstances, where servicing/maintenance is to be conducted during only one shift by an individual or a small number of persons working together, the installation of each individual's lockout/tagout device upon each energy isolating device would not be a burdensome procedure. However, when many energy sources or many persons are involved, and/or the procedure is to extend over more than one shift, (possibly several days, or weeks) consideration must be given to the implementation of a lockout/tagout procedure that will ensure the safety of the employees involved and will provide for each individual's control of the energy hazards. The following procedures are presented as examples to illustrate the implementation of a group lockout/tagout procedure involving many energy isolating devices and/or many servicing/maintenance personnel. They illustrate several alternatives for having authorized employees affix personal lockout/tagout devices in a group lockout/tagout setting. These examples are not intended to represent the only acceptable procedures for conducting group operations.

1. Definitions. Various terms used in the examples are defined below.

a. PRIMARY AUTHORIZED EMPLOYEE is the authorized employee who exercises overall responsibility for adherence to the company lockout/tagout procedure. (See 29 CFR 1910.147(f)(3)(ii)(A))

b. PRINCIPAL AUTHORIZED EMPLOYEE is an authorized employee who oversees or leads a group of servicing/ maintenance workers (e.g., plumbers, carpenters, electricians, metal workers, mechanics).

c. JOB-LOCK is a device used to ensure the continuity of energy isolation during a multi-shift operation. It is placed upon a lock-box. A key to the job-lock is controlled by each assigned primary authorized employee from each shift.

d. JOB-TAG with TAB is a special tag for tagout of energy isolating devices during group lockout/tagout procedures. The tab of the tag is removed for insertion into the lock-box. The company procedure would require that the tagout job-tag cannot be removed until the tab is rejoined to it.

e. MASTER LOCKBOX is the lockbox into which all keys and tabs from the lockout or tagout devices securing the machine or equipment are inserted and which would be secured by a "job-lock" during multi-shift operations.

f. SATELLITE LOCKBOX is a secondary lockbox or lock-boxes to which each authorized employee affixes his/her personal lock or tag.

g. MASTER TAG is a document used as an administrative control and accountability device. This device is normally controlled by the operations department personnel and is a personal tagout device if each employee personally signs on and signs off on it and if the tag clearly identifies each authorized employee who is being protected by it.

h. WORK PERMIT is a control document which authorizes specific tasks and procedure to be accomplished.

2. Organization. A group lockout/tagout procedure might provide the following basic organizational structure:

a. A primary authorized employee would be designated. This employee would exercise primary responsibility for implemen-tation and coordination of the lockout/tagout of hazardous energy sources, for the equipment to be serviced.

b. The primary authorized employee would coordinate with equipment operators before and after completion of servicing and maintenance operations which require lockout/tagout.

c. A verification system would be implemented to ensure the continued isolation and deenergization of hazardous energy sources during maintenance and servicing operations.

d. Each authorized employee would be assured of his/her right to verify individually that the hazardous energy has been isolated and/or deenergized.

e. When more than one crew, craft, department, etc., is involved, each separate group of servicing/maintenance personnel would be accounted for by a principal authorized employee from each group. Each principal employee is responsible to the primary authorized employee for maintaining accountability of each worker in that specific group in conformance with the company proce-dure. No person may sign on or sign off for another person, or attach or remove another person's lockout/tagout device, unless the provisions of the exception to 29 CFR 1910.147(e)(3) are met.

3. Examples of Procedures for Group Lockout/Tagout. Examples are presented for the various methods of lockout/tagout using lockbox procedures. An example of an applicable method for complex process equipment is also presented.

a. The following procedures address circumstances ranging from a small group of servicing/maintenance employees during a one-shift operation to a comprehensive operation involving many over a longer period.

(1) Type A. Each authorized employee places his/her personal lock or tag upon each energy isolating device and removes it upon departure from that assignment. Each authorized employee verifies or observes the deenergi-zation of the

equipment.

(2) Type B. Under a lockbox procedure, a lock or job-tag with tab is placed upon each energy isolation device after deenergization. The key(s) and removed tab(s) are then placed into a lockbox. Each authorized employee assigned to the job then affixes his/her personal lock or tag to the lockbox. As a member of a group, each assigned authorized employee verifies that all hazardous energy has been rendered safe. The lockout/tagout devices cannot be removed or the energy isolating device turned on until the appropriate key or tab is matched to its lock or tag.

(3) Type C. After each energy isolating device is locked/ tagged out and the keys/tabs placed into a master lockbox, each servicing/maintenance group "principal" authorized employee places his/her personal lock or tag upon the master lockbox. Then each principal authorized employee inserts his/her key into a satellite lockbox to which each authorized employee in that specific group affixes his/her personal lock or tag. As a member of a group, each assigned authorized employee verifies that all hazardous energy has been rendered safe. Only after the servicing/maintenance functions of the specific subgroup have been conducted and the personal locks or tags of the respective employees have been removed from the satellite lockbox can the principal authorized employee remove his/her lock from the master lockbox.

(4) Type D. During operations to be conducted over more than one shift (or even many days or weeks) a system such as described here might be used. Single locks/tags are affixed upon a lockbox by each authorized employee as described at Type B or Type C above. The master lockbox is first secured with a job-lock before subsequent locks by the principal authorized employees are put in place on the master lockbox. The job-lock may have multiple keys if they are in the sole possession of the various primary authorized employees (one on each shift). As a member of a group, each assigned authorized employee verifies that all hazardous energy has been rendered safe. In this manner, the security provisions of the energy control system are maintained across shift changes while permitting reenergization of the equipment at any appropriate time or shift.

b. Normal group lockout/tagout procedures require the affixing of individual lockout/tagout devices by each authorized employee to a group lockout device, as discussed in paragraph B.3.a. of this appendix. However, in the servicing and maintenance of sophisticated and complex equipment, such as process equipment in petroleum refining, petroleum production, and chemical production, there may be a need for adaptation and modification of normal group lockout/tagout procedures in order to ensure

the safety of the employees performing the servicing and maintenance. To provide greater worker safety through implementation of a more feasible system and to accommodate the special constraints of the standard's requirement for ensuring employees a level of protection equivalent to that provided by the use of a personal lockout or tagout device, an alternative procedure may be implemented if the company documentation justifies it. Lockout/tagout, blanking, blocking, etc., is often supplemented in these situations by the use of work permits and a system of continuous worker accountability. In evaluating whether the equipment being serviced or maintained is so complex as to necessitate a departure from the normal group lockout/tagout procedures (discussed in paragraph B.3.a.), to the use of an alternative procedure as set forth below, the following (often occurring simultaneously) are some of those which must be evaluated: physical size and extent of the equipment being serviced/maintained; the relative inaccessibility of the energy isolating devices; the number of employees performing the servicing/ maintenance; the number of energy isolating devices to be locked/tagged out; and the interdependence and interrelationship of the components in the system or between different systems.

(1) Once the equipment is shut down and the hazardous energy has been controlled, maintenance/servicing personnel, together with operations personnel, must verify that the isolation of the equipment is effective. The workers may walk through the affected work area to verify isolation. If there is a potential for the release or reaccumulation of hazardous energy, verification of isolation must be continued. The servicing/maintenance workers may further verify the effectiveness of the isolation by the procedures that are used in doing the work (e.g., using a bleeder valve to verify depressurization, flange-breaking techniques, etc.). Throughout the maintenance and/or servicing activity, operations personnel normally maintain control of the equipment. The use of the work permit or "master tag" system (with each employee personally signing on and signing off the job to ensure continual employee accountability and control), combined with verification of hazardous energy control, work procedures, and walk-through, is an acceptable approach to compliance with the group lockout/tagout and shift transfer provisions of the standard. (Note. B.1.g. of this appendix.)

(2) Specific issues related to the control of hazardous energy in complex process equipment are described below in a typical situation which can be found at any facility. This discussion is intended only as an example and is not anticipated to reflect operations at any specific facility.

(a) Complex process equipment which is scheduled for servicing/maintenance operations is generally identified by plant supervision. Plant supervision would issue specific work orders regarding the operations to be performed.

(b) In most instances where complex process equipment is to be serviced or maintained, the process equipment operators can be expected to conduct the shutdown procedure. This is generally due to their in depth knowledge of the equipment and the need to conduct the shut-down procedure in a safe, economic and specific sequence.

(c) The operations personnel will normally prepare the equipment for lockout/tagout as they proceed and will identify the locations for blanks, blocks, etc., by placing "operations locks and/or tags" on the equipment. The operations personnel can be expected to isolate the hazardous energy, and drain and flush fluids from the process equipment following a standard procedure or a specific work permit procedure.

(d) Upon completion of shutdown, the operations personnel would review the intended job with the servicing and maintenance crew(s) and would ensure their full comprehension of the energy controls necessary to conduct the servicing or maintenance safely. During or immediately after the review of the job, the servicing and maintenance crews would install locks, tags and/or special isolating devices at previously identified equipment locations following the specified work permit procedure.

(e) Line openings necessary for the isolation of the equipment would normally be permitted only by special work permits issued by operations personnel. (Such line openings should be monitored by operations personnel as an added safety measure.)

(f) All of the previous steps should have been documented by a master system of accountability and retained at the primary equipment control station for the duration of the job. The master system of accountability may manifest itself as a Master Tag which is subsequently signed by all of the maintenance/servicing workers if they fully comprehend the details of the job and the energy isolation devices actuated or put in place. This signing by the respective workers further verifies that energy isolation training relative to this operation has been conducted.

(g) After the system has been rendered safe, the authorized employees verify energy controls as described in B.3.b.(1) of this appendix.

(h) Specific work functions are controlled by work permits which are issued for each shift. Each day each authorized employee assigned must sign in on the work permit at the time of arrival to the job and sign out at departure. Signature, date, and time for sign-in and sign-out would be

recorded and retained by the applicable crew supervisor who upon completion of the permit requirements would return the permit to the operations supervisor. Work permits could extend beyond a single shift and may subsequently be the responsibility of several supervisors.

(i) Upon completion of the tasks required by the work permit, the authorized employees' names can be signed off the Master Tag by their supervisor once all employees have signed off the work permit. The work permit it then attached to the Master Tag. (Accountability of exposed workers is maintained.)

(j) As the work is completed by the various crews, the work permits and the accountability of personnel are reconciled jointly by the primary authorized employee and the operations supervisor.

(k) During the progress of the work, inspection audits are conducted.

(l) Upon completion of all work, the equipment is returned to the operations personnel after the maintenance and servicing crews have removed their locks, tags, and/or special isolating devices following the company procedure.

(m) At this time all authorized employees who are assigned to the tasks are again accounted for and verified to be clear from the equipment area.

(n) After the completion of the servicing/maintenance work, operations personnel remove the tags originally placed to identify energy isolation.

(o) Operations personnel then begin check-out, verification and testing of the equipment prior to being returned to production service.

C. Purpose. It should be noted that the purpose of the lockout/tagout standard is to reduce the likelihood of worker injuries and fatalities during servicing/maintenance operations. Therefore, when compliance officers inspect workplaces, they should evaluate the potential for employee exposure to the unexpected release of hazardous energy during servicing/maintenance operations. When a hazard is noted, the various requirements of the standard should be applied in a manner which will result in abatement of the hazardous circumstance.

LOCKOUT/TAGOUT CHECKLIST

1. Do you have an Energy Control/Lockout-Tagout Program? Does it consist of energy control procedures and employee training programs?

2. Were any documented hazard analysis decisions used in developing the Program? Per draft CPL.

3. What types of machinery/equipment is used on site?

4. What primary energy sources are used? What backup or stored energy sources are used?

5. What are the most energy sources utilized on one machine?

6. Are any hot tap operations performed?

7. What machinery or equipment has had major modification or repairs since Jan. 2, 1990?

8. Any new equipment etc. installed since January 2, 1990?

9. Do you have written energy control procedures for each type of machine?

10. Are any machines exempt from the written procedures? (.147(c)(4)(i), note)

11. What equipment is not capable of being locked out?

12. If tagout is used, what method is used to insure full employee protection?

13. How is the energy control program enforced?

14. What standardized hardware is used? How is it distinguished from other hardware? How do you identify who placed the device?

15. Who is authorized to perform lockout/tagout?

16. Have employees (authorized/affected/other) received training? Any re-training conducted? Why? Any records kept--names, dates? certified?

17. What is planned for conducting periodic inspections? (Review certified annual periodic inspection documents sometime after April 13, 1991.)

18. Method of group lockout?

19. What Lockout/Tagout procedures are used during shift or personnel changes?

20. What procedures are used when Lockout/Tagout devices have to be removed by another authorized person, not the one who originally placed the device?

21. What type of notification and coordination takes place with outside contractors?

15 Most Frequently Cited Violations
1910.147 - Lockout/Tagout

	Energy Control Program	
147(c)(1)		**2,007**
	Energy Control Procedures	
147(c)(4)(i)		**1,175**
	Training	
147(c)(7)(i)		**1,133**
	Content of Procedures	
147(c)(4)(ii)		**704**
	Hardware provided by employer	
147(c)(5)(i)		**463**
	Periodic inspections	
147(c)(6)(i)		**321**
	Certification of inspections	
147(c)(6)(ii)		**254**
	Certification of training	
147(c)(7)(iv)		**221**
	Devices affixed by authorized employees	
147(d)(4)(i)		**107**
	Devices singularly identified	
147(c)(5)(ii)		**78**
	Outside contractors - Exchange of procedures	
147(f)(2)(i)		**65**
	Identity of employee on devices	
147(c)(5)(ii)(D)		**64**
	Machine or equipment isolation	
147(d)(3)		**39**
	Capable of being locked out-Lockout or full employee protection	
147(c)(2)(ii)		**32**
	Tagout devices - Substantial	
147(c)(5)(ii)(C)(2)		**31**